

**ADDITIONAL FEES:**

No additional fees are believed required; however, should it be determined that a fee is due, authorization is hereby given to charge any such fee to our Deposit Account No. 01-0268.

**REMARKS**

In the last Office Action, the Examiner objected to the drawings under 37 C.F.R. §1.83(a) as failing to show features recited in claims 6, 16, 17 and 27. The drawings were further objected to as failing to comply with 37 C.F.R. §1.84(p)(5) because Fig. 2 does not show reference sign R1 described on page 13 of the specification. The title of the invention was objected to as not being descriptive. Claims 9 and 17 were rejected under 35 U.S.C. §112, second paragraph, for indefiniteness. Claims 1-3, 5, 7, 10, 19-21, 23-25, 33, 39, 41, 43, 45 and 47 were rejected under 35 U.S.C. §102(b) as being unpatentable over U.S. Patent No. 5,289,004 to Okada et al. ("Okada"). Claims 1, 7, 9, 10 and 34 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,335,522 to Shimada et al. ("Shimada"). Claims 1, 2, 10 and 34 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,581,083 to Majumdar et al. ("Majumdar '083"). Claims 12-14 and 37 were rejected under 35 U.S.C.

§102(b) as being anticipated by U.S. Patent No. 5,675,532 to Gemma et al. ("Gemma"). Claim 11 was rejected under 35 U.S.C. §103(a) as being unpatentable over Majumdar '083. Claim 8 was rejected under 35 U.S.C. §103(a) as being unpatentable over Shimada. Claim 4 was rejected under 35 U.S.C. 103(a) as being unpatentable over Okada, Shimada or Majumdar '083. Claims 6, 35 and 36 were rejected under 35 U.S.C. §103(a) as being unpatentable over Okada or Shimada in view of U.S. Patent No. 5,479,024 to Hillner et al. ("Hillner"). Claims 34, 40, 42, 44 and 46 were rejected under 35 U.S.C. §103(a) as being unpatentable over Okada in view of Shimada. Claim 38 was rejected under 35 U.S.C. §103(a) as being unpatentable over Gemma in view of Shimada. Claims 12 and 15 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,354,985 to Quate ("Quate '985") in view of Gemma. Claims 12, 16 and 18 were rejected under 35 U.S.C. §103(a) as being unpatentable over Shimada in view of Gemma. Claims 26-28 and 49 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,767,891 to Hirokane et al. ("Hirokane") in view of U.S. Patent No. 5,633,455 to Quate ("Quate '455"). Claims 17 and 29-32 were objected as being dependent upon a rejected base claim, but indicated to be allowable if rewritten in independent form to include all of the limitations of the base claim or any intervening claim. Additional art was cited of interest.

Applicants and applicants' counsel note with appreciation the indication of allowable subject matter concerning claims 17 and 29-32. However, for the reasons noted below, applicants respectfully submit that amended independent claim 1 and claims 5-16, 18-25, 27, 28 and 31-39 also patentably distinguish from the prior art of record.

In accordance with the present response, independent claim 1 has been amended to further patentably distinguish from the prior art of record. Allowable claims 17 and 29-30 have been rewritten in independent form to include all of the limitations of the corresponding base claim and any intervening claims. The feature of the convex portion being disposed "closer to the free end than the fixed end" recited in intervening claim 16 has been omitted from independent claim 17 in order to overcome the indefiniteness rejection. Thus, with respect to the position of the convex portion, independent claim 17 only requires that the convex portion is disposed "at a position closer to the fixed end than to the tip" of the cantilever. Claim 9 has been amended to overcome the indefiniteness rejection. Claims 2-4, 26-28 and 49 have been cancelled. The title of the invention has been changed to "NEAR-FIELD OPTICAL PROBE HAVING CANTILEVER AND PROBE FORMED OF TRANSPARENT MATERIAL, METHOD FOR MANUFACTURING NEAR-FIELD OPTICAL PROBE, AND OPTICAL APPARATUS HAVING NEAR-FIELD

OPTICAL PROBE" to more clearly reflect the invention to which the amended claims are directed. A new abstract has been substituted for the previously submitted abstract.

In view of the foregoing, applicants respectfully submit that the rejection of claims 9 and 17 under 35 U.S.C. §112, second paragraph, has been overcome and should be withdrawn.

With respect to the drawing objections, the drawings are being suitably revised to show the convex portion recited in claims 6, 16, 17, 27 and the reference sign R1 described on page 13 of the specification. Corrected formal drawings will be submitted to the Examiner shortly by supplemental response.

Attached hereto is a marked-up version of the changes made to the title, abstract and claims by the current amendment. The attached pages i-v are captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE".

Applicants respectfully request reconsideration of their application in light of the following discussion.

#### Brief Summary of the Invention

The present invention is directed to a near-field optical probe having a cantilever and a probe formed of a transparent material, a method for manufacturing the near-field optical probe, and an optical apparatus having the near-field optical probe.

As described in the specification (pgs. 1-3), conventional scanning near-field optical probes have been associated with problems which affect observation and measurement of accurate information from the surface of a sample. For example, the intensity of near-field light illuminated from a microscopic aperture of the conventional scanning near-field optical probes has not been able to be effectively increased. Furthermore, in the conventional SNOM probe shown in Fig. 17, since a structural part of the SNOM is disposed in an optical path of the microscope, the intensity of incident light or detection light attenuates due to reflection upon the structural part.

The present invention overcomes the drawbacks of the conventional art. Figs. 1-2 show an embodiment of a near-field optical probe 1000 according to the present invention embodied in the claims. The near-field optical probe 1000 has a cantilever 2 formed of a transparent material and having a first main surface and a second main surface opposite the first main surface. A base 3 supports the cantilever 2 at the first main surface. A tip 1 extends from the second main surface of the cantilever 2 and has a microscopic aperture 5 at an end thereof. According to the present invention, the tip 1 is formed of a transparent material having a higher refractive index than that of the transparent material of the

cantilever 2 in order to increase an amount of near-field light generated or detected by the microscopic aperture. A shade film 5 is formed on the second main surface of the cantilever 2 and on a surface of the tip 1 except for the microscopic aperture 5.

By the foregoing construction, the cantilever and the tip are formed of transparent materials having different optical characteristics. More specifically, by providing a tip formed of a transparent material having a higher refractive index than that of the transparent material of the cantilever, an amount of near-field light generated or detected by the microscopic aperture is increased as compared to the conventional art. Furthermore, the intensity of the near-field light generated or detected by the microscopic aperture is enhanced due to the higher refractive index of the tip transparent material.

#### **Traversal of Prior Art Rejections**

##### **Rejections Under 35 U.S.C. §102**

Claims 1, 3, 5, 7, 10, 19-21, 23-25, 33, 39, 41, 43, 45 and 47 were rejected under 35 U.S.C. §102(b) as being anticipated by Okada. Applicants respectfully traverse this rejection and submit that claims 1, 3, 5, 7, 10, 19-21, 23-25, 33, 39, 41, 43, 45 and 47 recite subject matter which is not identically disclosed or described in Okada.

Amended independent claim 1 is directed to a near-field optical probe and requires a cantilever formed of a transparent material and having a first main surface and a second main surface opposite the first main surface, a base supporting the cantilever at the first main surface, and a tip extending from the second main surface of the cantilever and having a microscopic aperture at an end thereof, the tip being formed of a transparent material having a higher refractive index than that of the transparent material of the cantilever to increase an amount of near-field light generated or detected by the microscopic aperture. Claim 1 further requires a shade film formed on the second main surface of the cantilever and on a surface of the tip except for the microscopic aperture. No corresponding structural combination is disclosed or described by Okada.

Okada discloses a near-field optical probe having a cantilever 7 and a probe 7a extending from a main surface of the cantilever 7. Okada further discloses that the probe 7a and the cantilever 7 are made of the same transparent material (e.g., silicon dioxide) (col. 18, lines 57-59). In contrast, amended independent claim 1 requires a near-field optical probe having a cantilever and tip made of different transparent materials (i.e., having different optical characteristics). More specifically, amended independent

claim 1 requires that the tip is formed of a transparent material having a higher refractive index than that of the transparent material of the cantilever to increase an amount of near-field light generated or detected by the microscopic aperture. No corresponding structure and function are disclosed are described by Okada.

In the absence of the foregoing disclosure recited in independent claim 1, anticipation cannot be found. See, e.g., W.L. Gore & Associates v. Garlock, Inc., 220 USPQ 303, 313 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984) ("Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration"); Continental Can Co. USA v. Monsanto Co., 20 USPQ2d 1746, 1748 (Fed. Cir. 1991) ("When more than one reference is required to establish unpatentability of the claimed invention anticipation under § 102 can not be found."); Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co., 221 USPQ 481, 485 (Fed. Cir. 1984) (emphasis added) ("Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim").

Stated otherwise, there must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the



invention. This standard is clearly not satisfied by Okada for the reasons stated above. Furthermore, Okada does not suggest the claimed subject matter and, therefore, would not have motivated one skilled in the art to modify Okada's near-field optical probe to arrive at the claimed invention.

Claims 3, 5, 7, 10, 19-21, 23-25, 33, 39, 41, 43, 45 and 47 depend on and contain all of the limitations of amended independent claim 1 and, therefore, distinguish from the references at least in the same manner as claim 1.

In view of the foregoing, applicants respectfully request that the rejection of claims 1, 3, 5, 7, 10, 19-21, 23-25, 33, 39, 41, 43, 45 and 47 under 35 U.S.C. §102(b) as being anticipated by Okada be withdrawn.

Claims 1, 7, 9, 10 and 34 were rejected under 35 U.S.C. §102(e) as being anticipated by Shimada. Applicants respectfully traverse this rejection and submit that claims 1, 7, 9, 10 and 34 recite subject matter which is not identically disclosed or described in Shimada.

Amended independent claim 1 is directed to a near-field optical probe as set forth above for the rejection of the claims under 35 U.S.C. §102(b) as being anticipated by Okada.

Shimada discloses a near-field optical probe having a tip and a cantilever formed of a transparent material.

However, Shimada does not disclose or describe that the tip of the near-field optical probe is formed of a transparent material having a higher refractive index than that of the transparent material of the cantilever to increase an amount of near-field light generated or detected by the microscopic aperture, as required by amended independent claim 1.

Since Shimada does not disclose or describe the foregoing features recited in amended independent claim 1, there can be no anticipation by Shimada of independent claim 1 under 35 U.S.C. §102(e). That is, since each and every limitation of independent claim 1 is not found in Shimada, the reference does not anticipate the claimed invention. See In re Lange, 209 USPQ 288, 293 (CCPA 1981). Furthermore, Shimada does not suggest the claimed subject matter and, therefore, would not have motivated one skilled in the art to modify Shimada's near-field optical probe to arrive at the claimed invention.

Claims 7, 9, 10 and 34 depend on and contain all of the limitations of amended independent claim 1 and, therefore, distinguish from the references at least in the same manner as claim 1.

In view of the foregoing, applicants respectfully request that the rejection of claims 1, 7, 9, 10 and 34 under 35 U.S.C. §102(e) as being anticipated by Shimada be withdrawn.

Claims 1, 2, 10 and 34 were rejected under 35 U.S.C. §102(e) as being anticipated by Majumdar '083. Applicants respectfully traverse this rejection and submit that claims 1, 2, 10 and 34 recite subject matter which is not identically disclosed or described in Majumdar.

Amended independent claim 1 is directed to a near-field optical probe as set forth above for the rejection of the claims under 35 U.S.C. §102(b) as being anticipated by Okada.

As recognized by the Examiner, Majumdar '083 discloses a near-field optical probe having a tip and a cantilever formed of the same transparent material. In contrast, amended independent claim 1 requires a near-field optical probe having a cantilever and tip made of different transparent materials (i.e., having different optical characteristics). More specifically, amended independent claim 1 requires that the tip is formed of a transparent material having a higher refractive index than that of the transparent material of the cantilever to increase an amount of near-field light generated or detected by the microscopic aperture.

In the absence of the foregoing disclosure recited in amended independent claim 1, anticipation cannot be found. Furthermore, Majumdar '083 does not suggest the claimed

subject matter and, therefore, would not have motivated one skilled in the art to modify Majumdar '083's near-field optical probe to arrive at the claimed invention.

Claims 2, 10 and 34 depend on and contain all of the limitations of amended independent claim 1 and, therefore, distinguish from the references at least in the same manner as claim 1.

In view of the foregoing, applicants respectfully request that the rejection of claims 1, 2, 10 and 34 under 35 U.S.C. §102(b) as being anticipated by Majumdar '083 be withdrawn.

Claims 12-14 and 37 were rejected under 35 U.S.C. §102(b) as being anticipated by Gemma. Applicants respectfully traverse this rejection and submit that claims 12-14 and 37 recite subject matter which is not identically disclosed or described in Gemma.

Amended independent claim 12 is directed to a near-field optical probe and requires a cantilever having a first main surface and a second main surface opposite the first main surface, the cantilever being disposed at an inclination angle  $\theta_1$  relative to a surface of a sample, a base supporting the cantilever at the first main surface, a tip having a height H and extending from the second main surface of the cantilever and having a microscopic aperture at an end thereof, and a

shade film formed on the second main surface of the cantilever and on a surface of the tip except for the microscopic aperture. Claim 12 further requires that when a radius of a light spot on the cantilever resulting from light incident on the tip or light detected by the microscopic aperture and being incident on a detector is  $R_1$ , a distance  $L_1$  from a center of the tip to a free end of the cantilever satisfies the equation  $R_1 < L_1 < H/\tan \theta_1$ . No corresponding structural combination is disclosed or suggested by the prior art of record.

Gemma discloses a near-field optical probe having a cantilever 30 made of an optical fiber (Fig. 2). Light is emitted from a semiconductor laser 106 onto a rear surface of the cantilever 30. Light reflected by the cantilever is detected by a photodiode 107. However, Gemma does not disclose or describe the condition met by the structural combination of the near-field optical probe recited in independent claim 12. More specifically, Gemma does not disclose or describe that when a radius of a light spot on the cantilever resulting from light incident on the tip or light detected by the microscopic aperture and being incident on a detector is  $R_1$ , a distance  $L_1$  from a center of the tip to a free end of the cantilever satisfies the equation  $R_1 < L_1 < H/\tan \theta_1$ . Contrary to the Examiner's contention, Figs. 7 and 8 of

Gemma do not disclose the value of the distance  $L1$  within the range set forth by the equation  $R1 < L1 < H/\tan \theta 1$  as required by independent claim 12. If the Examiner continues to maintain this rejection, applicants respectfully request that the Examiner point out to the specific disclosure in Gemma which purportedly shows that the distance  $L1$  satisfies the range in the equation  $R1 < L1 < H/\tan \theta 1$ .

In the absence of the foregoing disclosure recited in independent claim 12, anticipation cannot be found. Furthermore, Gemma does not suggest the claimed subject matter and, therefore, would not have motivated one skilled in the art to modify Gemma's near-field optical probe to arrive at the claimed invention.

Claims 13, 14 and 37 depend on and contain all of the limitations of independent claim 12 and, therefore, distinguish from the references at least in the same manner as claim 12.

In view of the foregoing, applicants respectfully request that the rejection of claims 12-14 and 37 under 35 U.S.C. §102(b) as being anticipated by Gemma be withdrawn.

#### **Rejections Under 35 U.S.C. §103**

Claims 6, 11, 34-36, 38, 40, 42, 44, 46 and 48 were rejected under 35 U.S.C. §103(a) as being unpatentable over the respective references to Majumdar '03, Shimada, Okada,

Hillner, Gemma and Quate '985. Applicants respectfully traverse these rejections and submit that the combined teachings of the cited references do not disclose or suggest the subject matter recited in claims 6, 11, 34-36, 40, 42, 44, 46 and 48.

Claims 6, 11, 34-36, 40, 42, 44, 46 and 48 depend on and contain all of the limitations of amended independent claim 1 and, therefore, distinguish from the references at least in the same manner as claim 1.

In view of the foregoing, applicants respectfully request that the rejection of claims 6, 11, 34-36, 38, 40, 42, 44, 46 and 48 under 35 U.S.C. §103(a) as being unpatentable over the respective references to Majumdar '03, Shimada, Okada, Hillner, Gemma and Quate '985 be withdrawn.

Claim 38 was rejected under 35 U.S.C. §103(a) as being unpatentable over Gemma in view of Shimada. Applicants respectfully traverse this rejection and submit that the combined teachings of Gemma and Shimada do not disclose or suggest the subject matter recited in claim 38.

The primary reference to Gemma does not disclose or suggest the subject matter recited in independent claim 12 as set forth above for the rejection of claims 12-14 and 37 under 35 U.S.C. §102(b) as being anticipated by Gemma. Claim 38 depends on and contains all of the limitations of independent

claim 12 and, therefore, distinguishes from Gemma at least in the same manner as claim 12.

The secondary reference to Shimada was cited by the Examiner for its disclosure of a probe having a pyramidal-shaped tip. However, Shimada does not disclose or suggest the structural combination of the near-field optical probe recited in independent claim 12, including the condition that when a radius of a light spot on the cantilever resulting from light incident on the tip or light detected by the microscopic aperture and being incident on a detector is  $R_1$ , a distance  $L_1$  from a center of the tip to a free end of the cantilever satisfies the equation  $R_1 < L_1 < H / \tan \theta_1$ . Since Shimada does not disclose or suggest the structure and condition required by independent claim 12, it does not cure the deficiencies of Gemma. Accordingly, one of ordinary skill in the art would not have been led to modify the references to attain the claimed subject matter.

In view of the foregoing, applicants respectfully request that the rejection of claim 38 under 35 U.S.C. §103(a) as being unpatentable over Gemma in view of Shimada be withdrawn.

Claims 12 and 15 were rejected under 35 U.S.C. §103(a) as being unpatentable over Quate '985 in view of Gemma. Applicants respectfully traverse this rejection and



submit that the combined teachings of Quate '985 and Gemma do not disclose or suggest the subject matter recited in claims 12 and 15.

The primary reference to Quate '985 discloses a near field optical probe having a cantilever and a tip. As recognized by the Examiner, Quate '985 does not disclose or suggest that the cantilever is disposed at an angle  $\theta_1$ . Furthermore, Shimada does not disclose or suggest that when a radius of a light spot on the cantilever resulting from light incident on the tip or light detected by the microscopic aperture and being incident on a detector is  $R_1$ , a distance  $L_1$  from a center of the tip to a free end of the cantilever satisfies the equation  $R_1 < L_1 < H/\tan \theta_1$ , as required by independent claim 12.

The Examiner cited the secondary reference to Gemma for its disclosure of a cantilever for near-field probing. However, Gemma does not disclose the subject matter recited in independent claim 12 as set forth above for the rejection of claims 12-14 and 37 under 35 U.S.C. §102(b) as being anticipated by Gemma. More specifically, Gemma does not disclose or suggest that when a radius of a light spot on the cantilever resulting from light incident on the tip or light detected by the microscopic aperture and being incident on a detector is  $R_1$ , a distance  $L_1$  from a center of the tip to a

free end of the cantilever satisfies the equation  $R1 < L1 < H / \tan \theta 1$ , as required by independent claim 12. Since Gemma does not disclose or suggest this feature required by independent claim 12, it does not cure the deficiencies of Quate '985. Accordingly, one of ordinary skill in the art would not have been led to modify the references to attain the claimed subject matter.

Claim 15 depends on and contain all of the limitations of independent claim 12 and, therefore, distinguishes from the references at least in the same manner as claim 12.

In view of the foregoing, applicants respectfully request that the rejection of claims 12 and 15 under 35 U.S.C. §103(a) as being unpatentable over Quate '985 in view of Gemma be withdrawn.

Claims 12, 16 and 18 were rejected under 35 U.S.C. §103(a) as being unpatentable over Shimada in view of Gemma. Applicants respectfully traverse this rejection and submit that the combined teachings of Shimada and Gemma do not disclose or suggest the subject matter recited in claims 12, 16 and 18.

The primary reference to Shimada discloses a near field optical probe having a cantilever and a tip. As recognized by the Examiner, Shimada does not disclose or

suggest that the cantilever is disposed at an angle  $\theta_1$ . Furthermore, Shimada does not disclose or suggest that when a radius of a light spot on the cantilever resulting from light incident on the tip or light detected by the microscopic aperture and being incident on a detector is  $R_1$ , a distance  $L_1$  from a center of the tip to a free end of the cantilever satisfies the equation  $R_1 < L_1 < H/\tan \theta_1$ , as required by independent claim 12.

The Examiner cited the secondary reference to Gemma for its disclosure of a cantilever for near-field probing. However, Gemma does not disclose the subject matter recited in independent claim 12 as set forth above for the rejection of claims 12-14 and 37 under 35 U.S.C. §102(b) as being anticipated by Gemma. More specifically, Gemma does not disclose or suggest that when a radius of a light spot on the cantilever resulting from light incident on the tip or light detected by the microscopic aperture and being incident on a detector is  $R_1$ , a distance  $L_1$  from a center of the tip to a free end of the cantilever satisfies the equation  $R_1 < L_1 < H/\tan \theta_1$ , as required by independent claim 12. Since Gemma does not disclose or suggest this feature required by independent claim 12, it does not cure the deficiencies of Shimada. Accordingly, one of ordinary skill in the art would not have been led to modify the references to attain the claimed subject matter.

Claims 16 and 18 depend on and contain all of the limitations of independent claim 12 and, therefore, distinguish from the references at least in the same manner as claim 12.

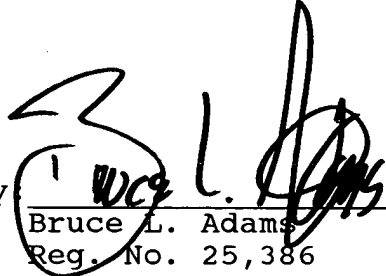
In view of the foregoing, applicants respectfully request that the rejection of claims 12, 16 and 18 under 35 U.S.C. §103(a) as being unpatentable over Shimada in view of Gemma be withdrawn.

In view of the foregoing amendments and discussion, the application is believed to be in allowable form.

Accordingly, favorable reconsideration and allowance of the claims are most respectfully requested.

Respectfully submitted,

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MAILING CERTIFICATE

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Debra Buonincontri

Name



Signature

June 30, 2003

Date

"VERSION WITH MARKINGS TO SHOW CHANGES MADE"

IN THE ABSTRACT:

The previously submitted abstract has been replaced with the following new abstract:

A near-field optical probe has a cantilever formed of a transparent material and having a first main surface and a second main surface opposite the first main surface. A base supports the cantilever at the first main surface. A tip extends from the second main surface of the cantilever and has a microscopic aperture at an end thereof. The tip [and the cantilever are] is formed of a transparent material having a higher refractive index than that of the transparent material of the cantilever to increase an amount of near-field [high transmissivity relative to a wavelength of] light generated or detected by the microscopic aperture. A shade film is formed on the second main surface of the cantilever and on a surface of the tip except for the microscopic aperture.

**IN THE CLAIMS:**

Claims 1, 9, 17, 29 and 30 have been amended as follows:

1. (Twice Amended) A near-field optical probe, comprising:

a cantilever formed of a transparent material and having a first main surface and a second main surface opposite the first main surface;

a base supporting the cantilever at the first main surface;

a tip extending from the second main surface of the cantilever and having a microscopic aperture at an end thereof, the tip [and the cantilever] being formed of a transparent material having a higher refractive index than that of the transparent material of the cantilever to increase an amount of near-field [high transmissivity relative to a wavelength of] light generated or detected by the microscopic aperture; and

a shade film formed on the second main surface of the cantilever and on a surface of the tip except for the microscopic aperture.

9. (Twice Amended) A near-field optical probe according to claim 7; wherein the lens comprises a [refractive-index distribution-type] gradient-index lens.

17. (Twice Amended) A near-field optical probe comprising: a cantilever having a first main surface, a second main surface opposite the first main surface, a fixed end, a free end opposite to the fixed end, and a convex portion [according to claim 16; wherein the convex portion is] disposed on the second main surface [of the cantilever] at a position closer to the free end than the fixed end, the cantilever being disposed at an inclination angle  $\theta_1$  relative to a surface of a sample; a base supporting the cantilever at the first main surface; a tip having a height H and extending from the second main surface of the cantilever and having a microscopic aperture at an end thereof, the convex portion of the cantilever being disposed at a position closer to the fixed end of the cantilever than to the tip[; and wherein], and a height of the tip [is] being greater than a height of the convex portion[.]; and a shade film formed on the second main surface of the cantilever and on a surface of the tip except for the microscopic aperture; wherein when a radius of a light spot on the cantilever resulting from light incident on the tip or light detected by the microscopic aperture and being incident on a detector is  $R_1$ , a distance  $L_1$  from a center of the tip to a free end of the cantilever satisfies the equation  $R_1 < L_1 < H / \tan \theta_1$ .



29. (Twice Amended) A method for manufacturing a near-field optical probe, comprising the steps of: [according to claim 26; further comprising the step of] forming a step portion on [the] a substrate; [prior to providing the transparent member on the substrate;] providing a transparent member on a first main surface of the substrate; etching a part of the transparent member to form a tip [wherein in the step of etching to form the tip, the transparent member is etched in part to thereby form the tip] in the vicinity of the step portion[.]; forming a mask on the transparent member covering the tip and etching the transparent member using the mask to form a lever; etching the substrate from a second main surface opposite to the first main surface to form a base; and forming a shade film on the lever and on the tip except for an end portion of the tip.

30. (Twice Amended) A method for manufacturing a near-field optical probe, comprising the steps of: [according to claim 26; further comprising the steps of] forming a step portion on [the] a substrate; [prior to providing the transparent member on the substrate, and] burying a weight material to be used as a weight portion in the step portion[.]; providing a transparent member on a first main surface of the substrate; etching a part of the transparent member to form a tip; forming a mask on the transparent member covering the tip and etching the transparent member using the

mask to form a lever; etching the substrate from a second main surface opposite to the first main surface to form a base; and forming a shade film on the lever and on the tip except for an end portion of the tip.